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None

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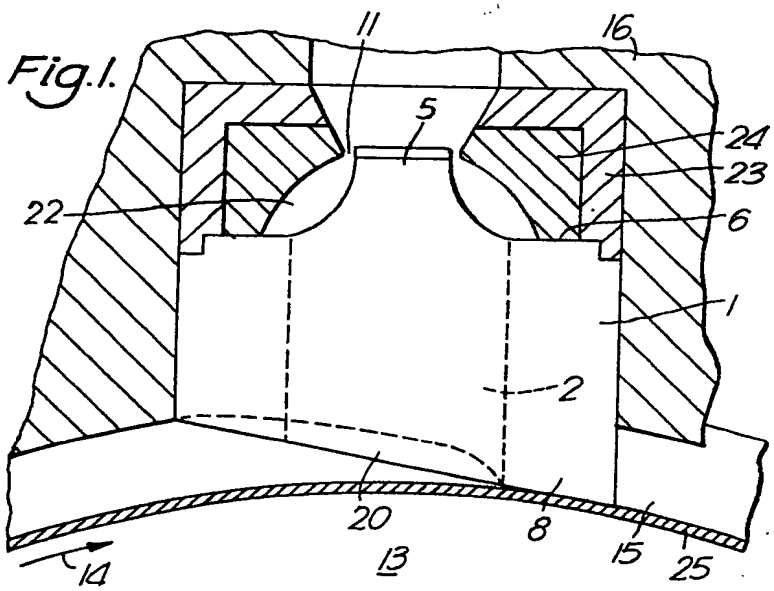
(54) Improvements in extrusion

(57) In continuous extrusion by the Conform process material to be extruded is drawn along a passageway, formed by a groove 15 in a rotating wheel 13 and a stationary overlying shoe member 16, to impinge against an abutment 8. Extruded material is ejected through a die located at or adjacent the abutment 8. The abutment face 20 blocking the groove 15 is inclined to thereby present an increase in abutment surface area to the pressure exerted by the material during extrusion. A reducing atmosphere can be provided in and about the groove 15 to reduce oxidation in the material and thereby improve the quality of the extruded product.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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Fig.1.

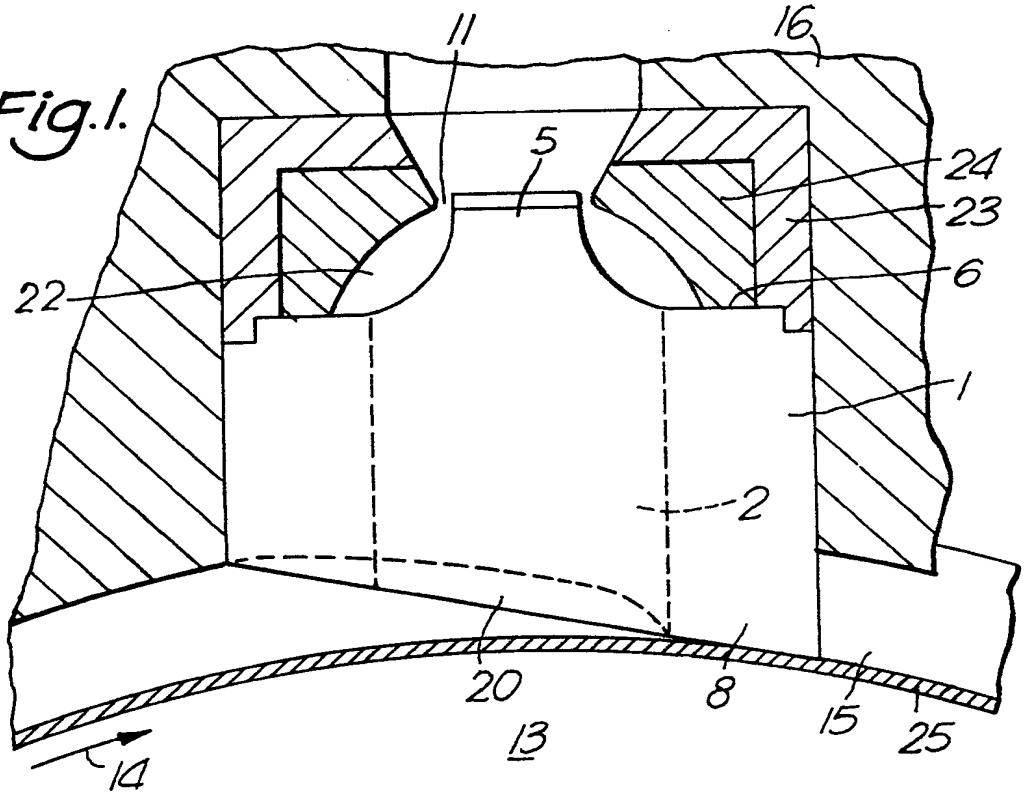
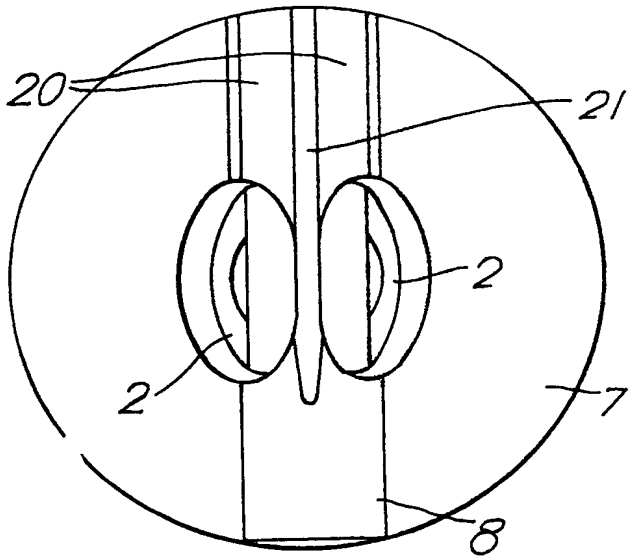


Fig.2.



Improvement in Extrusion

The present invention concerns extrusion and in particular continuous extrusion by the Conform process.

The basic Conform process is disclosed in UK Patent Specification No. 1,370,894. Material to be extruded is drawn along a passageway defined by a groove in a rotating wheel and an overlying shoe member to impinge against an abutment member blocking the passage. The material is forced through a die member at or adjacent the abutment as an extruded product.

The aim of the present invention is to reduce the load bearing on the abutment and the die member during extrusion and to improve the quality of the extruded product.

According to the present invention there is provided, in an apparatus for continuous extrusion, a combined abutment member and die member, and in which the surface of the abutment member in contact with the material being extruded is inclined in the direction of travel of the material to thereby present an increase in abutment surface area to the pressure exerted by the material during extrusion. As a result of the inclination of the abutment there is a decrease in the resultant force exerted by the material on the abutment in the direction of rotation. Similarly, combining the die member with the abutment reduces the distance through which the material is required to move in passing from the wheel groove through the die member and accordingly

results in a decrease in the pressure required to effect extrusion. Both of these effects of reducing the pressure reduce the load exerted on the component parts of the abutment and die members with a consequent enhancement of the working lives of such parts.

The materials being extruded can be metals which are prone to oxidation. This is true for all metals but is especially thecase for copper which readily oxidises during extrusion to the detriment of the extruded product.

To improve the quality of product extruded by the Conform process means for providing a reducing environment can be arranged in and about the passageway to receive feed material.

The reducing environment can be a gas or a liquid or a combination of both gas a liquid. For example, the gas can be a non-explosive mixture of nitrogen and hydrogen while the liquid can be an alcohol/water mixture.

During extrusion a tyre is formed in the wheel groove by material at the abutment adhering to the walls and base of the groove. At the elevated running temperatures of the Conform process this tyre readily oxidises to contaminate fresh feed material being introduced into the groove and passageway. An enclosure for a reducing atmosphere can be provided about the wheel and shoe members and the enclosure can be filled with, for example, a hydrogen/nitrogen mixture. The mixture can comprise 95% nitrogen and 5% hydrogen by volume. The

extrusion thereby takes place in a predominantly inert atmosphere provided by the nitrogen. The hydrogen serves to reduce oxides formed in the extrusion process.

Alternatively, a liquid reducing coolant can be introduced into the passageway. Thus liquid can be sprayed into the passageway immediately after the abutment and at other regions around the passageway. The liquid can be an alcohol/water mixture. The alcohol, for example methyl alcohol, serves as a reducing agent and the water acts as a coolant to reduce the temperature of the tyre in the groove. Both effects, that is the reducing environment and the coolant serve to diminish the formation of oxide in the groove.

The liquid reducing coolant can also be used in combination with the gaseous reducing atmosphere.

It is anticipated that the provision of a reducing environment, either gaseous, liquid or both will be particularly beneficial for the extrusion of copper products.

As an example only, an embodiment of the invention will now be described with reference to the accompanying diagrammatic drawings, in which:

Fig 1 is a schematic view of a portion of an extrusion apparatus; and

Fig 2 is a plan view of an abutment and die assembly, not to scale.

The drawings show a die assembly for use in a continuous extrusion apparatus such a disclosed in UK

Patent Specifications 1,370,894 and 1,434,201. Briefly, the apparatus comprises a wheel 13 secured to a horizontal drive shaft (not shown) to rotate in the direction of arrow 14. An endless peripheral groove 15 is formed in the wheel 13 and a stationary shoe member 16 overlies a part of the periphery of the wheel 13.

The shoe member 16 supports a combined die and abutment member formed in two parts. A first part comprises a body 1 having tapered apertures 2 therethrough disposed symmetrically about the axis of the body. An integral mandrel 5 projects axially from face 6 of the body, the mandrel terminating in a boss which can have a hardened surface such as stellite (RTM). The opposite face 7 of the circular body 1 has a diametral portion which extends into the groove 15 in the wheel 13 to form an abutment 8 to block the passageway formed by the groove in the wheel 13 and the overlying shoe member 16. The abutment 8 is inclined to the direction of travel of material introduced into the passageway by providing grooves or flutes 20 therein at opposite sides of a centre portion 21. The grooves or flutes 20 extend from the leading end of the abutment 8 to terminate at the apertures 2 in the body 1. The effect is the same as providing an abutment which extends from the body 1 to fill the passageway and then cutting the grooves or flutes 20 to provide access for material flow to the apertures 2. The grooves or flutes 20 provide the inclined surface of the abutment.

The second part of the combined die and abutment member comprises a cup-shaped body 23 cooperable with the first part and having a ceramic insert 24 which defines an extrusion chamber 22. The mandrel 5 extends into the chamber 22 and cooperates with throat portion 11 of the second part to define an annular gap through which material is extruded in the form of tube.

During extrusion a layer of the material 25 being extruded is deposited on the walls of the groove 15 in the wheel, the thickness of such a layer being determined by the spacing or clearance between the abutment and the walls of the groove. Such a layer assists in the frictional drag of the material along the passageway towards the extrusion die.

The feed material can be a metal such as aluminium and copper which have hitherto been extruded by the conform process. In addition it is now possible to extrude copper alloys such as brass by means of continuous extrusion and consequently the apparatus of the present invention can be used for the extrusion of brass and other metal tube. Whilst the illustrated embodiment is for the extrusion of tubular product the concept of an inclined abutment is equally valid for the continuous extrusion of solid product such as wire and rod.

A reducing gas and liquid coolant can be directed into the exposed parts of the groove 15 not covered by the shoe member.

Thus spray jets can be arranged immediately behind the abutment 8. Further a crescent-shaped spray housing can be arranged over the exposed part of the groove not covered by the shoe member 16 to direct reducing agent and coolant, which can be gas or liquid, into the groove 15 by way of spaced apart jets or spray holes in the housing. A scraper blade can cooperate with the groove at the downstream end of the spray housing. Finally a jet or jets can be arranged to direct reducing gas into the groove 15 immediately before the introduction of the feed material.

The provision of a reducing atmosphere in and about the groove 15 in the wheel reduces the extent of oxide foundation in the material being extruded, especially when the material is a metal.

Claims

1. An apparatus for continuous extrusion by the Conform Process having a combined abutment member and die member and in which the surface of the abutment member is contact with the material being extruded is inclined in the direction of travel of the material to thereby present an increase in abutment surface area to the pressure exerted by the material during extrusion.

2. An apparatus as claimed in Claim 1 including means for providing a reducing environment in and about the passageway to receive feed material.

3. An apparatus as claimed in Claim 2 in which the reducing environment is a gas or a liquid or a combination of both gas and liquid.

4. An apparatus for continuous extrusion substantially as herein described with reference to and as illustrated in the accompanying drawings.

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